

Unit 05: Heredity - Inheritance and Variation of Traits (Week 19 - Week 24)

Content Area: **Template**
Course(s):
Time Period: **Full Year**
Length: **FY**
Status: **Published**

Standards Alignment

MS-LS3: Heredity: Inheritance and Variation of Traits

- **MS-LS3-1:** Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism.
- **MS-LS3-2:** Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.

New Jersey Student Learning Standards

LA.K-12.NJSLSA.R3	Analyze how and why individuals, events, and ideas develop and interact over the course of a text. Craft and Structure
LA.K-12.NJSLSA.R4	Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone. Integration of Knowledge and Ideas
LA.K-12.NJSLSA.R7	Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.
LA.K-12.NJSLSA.R8	Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence.
LA.K-12.NJSLSA.R9	Analyze and reflect on how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.
LA.RST.6-8	Reading Science and Technical Subjects
LA.RST.6-8.3	Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
LA.RST.6-8.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics.
LA.RST.6-8.7	Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
LA.RST.6-8.8	Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.

LA.RST.6-8.9	Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.
SCI.MS-LS1	From Molecules to Organisms: Structures and Processes
SCI.MS-LS1-4	Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.
SCI.MS-LS1-5	Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.
SCI.MS-LS3	Heredity: Inheritance and Variation of Traits
SCI.MS-LS3-1	Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism.
SCI.MS-LS3-2	Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.
SCI.MS-LS4	Biological Evolution: Unity and Diversity
SCI.MS-LS4-5	Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.

Integration of Career Readiness, Life Literacies and Key Skills

CRP.K-12.CRP1	Act as a responsible and contributing citizen and employee.
CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP3	Attend to personal health and financial well-being.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP5	Consider the environmental, social and economic impacts of decisions.
CRP.K-12.CRP6	Demonstrate creativity and innovation.
CRP.K-12.CRP7	Employ valid and reliable research strategies.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP9	Model integrity, ethical leadership and effective management.
CRP.K-12.CRP10	Plan education and career paths aligned to personal goals.
CRP.K-12.CRP11	Use technology to enhance productivity.
CRP.K-12.CRP12	Work productively in teams while using cultural global competence.

Technology / Integration of Computer Science and Design Thinking

TECH.8.1.8	Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
TECH.8.1.8.A	Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.
TECH.8.1.8.A.1	Demonstrate knowledge of a real world problem using digital tools.
TECH.8.1.8.A.4	Graph and calculate data within a spreadsheet and present a summary of the results.

TECH.8.2.8	Technology Education, Engineering, Design, and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.
TECH.8.2.8.A	The Nature of Technology: Creativity and Innovation: Technology systems impact every aspect of the world in which we live.
TECH.8.2.8.A.1	Research a product that was designed for a specific demand and identify how the product has changed to meet new demands (i.e., telephone for communication - smart phone for mobility needs).
TECH.8.2.8.A.2	Examine a system, consider how each part relates to other parts, and discuss a part to redesign to improve the system.

Interdisciplinary Connections: NJSL for ELA, Social Studies, Science and/or Math Section

	Key Ideas and Details
LA.K-12.NJSLSA.R1	Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
LA.K-12.NJSLSA.R2	Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.
	Integration of Knowledge and Ideas
LA.K-12.NJSLSA.R7	Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.
LA.K-12.NJSLSA.R8	Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence.
	Reading Informational Text
LA.RI.7	
LA.RI.7.1	Cite several pieces of textual evidence and make relevant connections to support analysis of what the text says explicitly as well as inferences drawn from the text.
LA.RI.7.2	Determine two or more central ideas in a text and analyze their development over the course of the text; provide an objective summary of the text.
	Text Types and Purposes
LA.K-12.NJSLSA.W1	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
LA.RI.7.7	Compare and contrast a text to an audio, video, or multimedia version of the text, analyzing each medium's portrayal of the subject (e.g., how the delivery of a speech affects the impact of the words).
LA.RI.7.8	Trace and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient to support the claims.
LA.K-12.NJSLSA.W9	Draw evidence from literary or informational texts to support analysis, reflection, and research.
LA.W.7.1	Write arguments to support claims with clear reasons and relevant evidence.
LA.W.7.9	Draw evidence from literary or informational texts to support analysis, reflection, and research.

Integration of Diversity, Equity and Inclusion; Climate Change; Informational and Media LiteracyNew Section

see Crosswalks

21st Century Life and Careers

Stage I: Desired Results

Transfer/Overview/Rationale

Transfer / Overview / Rationale

Unit Rationale

The purpose of this unit...

Organisms within a species have similarities and differences. These variations in traits, whether intraspecific or interspecific, originate from small, yet cumulative changes in an organism's cellular structure; genetic processes work in combination with an organism's environment and experiences to influence development and behavior. Mutations occur randomly or can be a result of the transfer of molecular information. Beneficial mutations are selected through a process of natural selection and lead to variation or an entirely new species. Variation can also be a result of selective breeding techniques applied through genetic engineering practices. These traits/variations are often selected based on favorable traits in consumable products. Current genetic advancements are advance modern medicine and contributing to the society in which we live.

Meaning

Essential Questions

Essential Questions

How is DNA important in reproduction of offspring?

What are the mechanisms of reproduction and heredity and how do they function to ensure continuity of life?

How do living organisms pass traits from one generation to the next?

What are the advantages and disadvantages of different reproductive strategies?

How does the manipulation of genes affect the quality of an organism?

Enduring Understanding/Indicators of Understanding

Enduring Understanding/Indicators of Understanding

Genetics is the science of genes, heredity, and the variation of organisms.

Heredity involves probability and predicting the likelihood of a certain genotype to occur.

All organisms reproduce either sexually or asexually and have genes, which are units of information for inherited traits passed from parents to offspring.

Organisms inherit genetic information in a variety of ways that result in continuity of structure and function between parents and offspring.

Both heredity and environment play a role in determining the traits of an organism.

Acquisition (Student Learning Objectives)

Knowledge

Knowledge

Students will know...

The natural world consists of a diversity of organisms that transmit their characteristics to future generations. Living things reproduce, develop, and transmit traits, and theories of evolution explain the unity and diversity of species found on Earth. Knowledge of genetics, reproduction, and development is applied to improve agriculture and human health.

Growth and Development of Organisms: Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring. Sexual reproduction results in offspring that have greater genetic diversity than those resulting in asexual reproduction. Organisms have different reproductive strategies to ensure survival of their offspring.

Inheritance of Traits in Offspring: Genes are located in chromosomes of cells, with each chromosome pair containing two variants of each of many distinct genes. Each distinct gene chiefly controls the production of specific proteins, which in turn affects the traits of the individual.

Variation of Traits in Offspring: In sexually reproducing organisms, each parent contributes half of the genes acquired (at random) by the offspring. Individuals have two of each chromosome and hence two alleles of each gene. These versions may be identical or may differ from each other.

Alterations in Genes Affect an Organism: In addition to variations that arise from sexual reproduction, genetic information can be altered because of mutations. Mutations to genes can result in changes in proteins, which can affect the structure and functions of the organism and thereby change traits. Some changes are beneficial, others harmful, and some neutral to the organism.

Skills

Skills

Student will be skilled at ...

Students will understand the transmission of traits in living things.

Students will use simple laws of probability and mathematics to predict patterns of heredity with the use of Punnett squares.

Students will explain the laws of heredity and their relationship to the structure and function of DNA.

Students will recognize and understand the differences between mitosis and meiosis in cellular respiration.

Students will recognize that changes in DNA and anomalies in chromosomes create changes in organisms.

Stage 3: Learning Plan

Resource and Mentor Texts

Resources and Mentor Texts

Internet/Videos

Interactive Notebooks/Materials

Google Presentations

Interactive Websites

Document Camera

Lab Materials

[Copies of Student Activity Materials](#)

Formative Assessment Strategies

Formative Assessment Strategies

Observation/Discussion/Informal Questioning

Interactive Notebook Activities/Graphic Organizers

Quizzes/Checkpoints/Wrap-Ups

Peer/Self Assessments (Reflection)

Notebook Checks

Virtual labs

Learning Activities/Unit of Study

Learning Activities/Unit of Study

Structure of DNA: Modeling DNA Structure

Chromosomes and Genes: Chromosome Challenge Activity - Sock Scramble

Mitosis and Meiosis: Gummy Worm Mitosis/Meiosis Activity

Modern Genetics & Predicting Inherited Traits: Human Traits Lab; SpongeBob Genetics

[Introduction to Heredity Activities](#)

[Modeling DNA Structure](#)

[Chromosome Challenge Activity - Sock Scramble](#)

[Gummy Worm Mitosis/Meiosis Activity](#)

[Human Traits Lab](#)

Modifications and/or Accommodations

Suggested Modifications (ELL, Sp. Ed, Gifted, At-risk of Failure)

English Language Learners

Native language support: The teacher provides auditory or written content to students in their native language.

Adjusted Speech: The teacher changes speech patterns to increase student comprehension. This could include facing the students, paraphrasing, clearly indicating the most important ideas, and speaking more slowly.

Visuals: The teacher uses graphics, pictures, visuals, and manipulatives. This helps ELL students better understand and comprehend the subjects at hand.

Front-Loading Vocabulary: The teacher front loads vocabulary. This means providing students with a list of important vocabulary words they will need to know for a book, lesson, etc. prior to the lesson being taught. Including pictures to go with the vocabulary words is also very beneficial for the students.

Special Education Students

Chunking: The teacher presents information in a way that makes it easy for students to understand and remember. Chunking is based on the presumption that our working memory is easily overloaded by excessive detail. The best way to deliver information is to organize it into meaningful units. Because students with special needs get overloaded easily, chunking is an effective strategy to use with them.

Checking for Understanding: It is important to constantly check for understanding, especially for students who have accommodations. Teachers want to make sure students understand the concepts being covered in a way that makes sense to them.

Extra time: The teacher provides students with special needs extra time to complete work or answer questions. It is important to give students enough time to process their thoughts.

Oral Reading: The teacher will read work orally to students. Class work such as tests and literature circles may need to be read aloud to the student.

Timers: The teacher will use timers as an instructional tool. The use of timers is beneficial for students who have trouble completing tasks. Timers can be helpful so the student is aware of how much time they have to complete an assignment.

Students with 504 Plans

Chunking: The teacher presents information in a way that makes it easy for students to understand and remember. Chunking is based on the presumption that our working memory is easily overloaded by excessive detail. The best way to deliver information is to organize it into meaningful units. Because students with special needs get overloaded easily, chunking is an effective strategy to use with them.

Checking for Understanding: It is important to constantly check for understanding, especially for students who have accommodations. Teachers want to make sure students understand the concepts being covered in a way that makes sense to them.

Extra time: The teacher provides students with special needs extra time to complete work or answer questions. It is important to give students enough time to process their thoughts.

Gifted & Talented Strategies

Extensions/Enrichments: Teachers will provide gifted and talented students with extension/enrichment projects. Students will be challenged to further their understanding, to apply acquired knowledge, and/or to produce something in reference to acquired knowledge.

Modify/Change Activities: Teachers will monitor and modify activities to accommodate those students who need to be challenged further. Additional reading, problem-solving, writing, or project work is necessary for those students who are ready to move on at a rate more accelerated than their peers. In this way, G & T students are provided the same opportunity for support as special needs students.

Students at Risk of School Failure

Directions or Instructions: Make sure directions and/or instructions are given in limited numbers. Give directions/instructions verbally and in simple written format. Ask students to repeat the instructions or directions to ensure understanding occurs. Check back with the student to ensure he/she hasn't forgotten.

Peer Support: Peers can help build confidence in other students by assisting in peer learning. Many teachers use the 'ask 3 before me' approach. This is fine, however, a student at risk may have to have a specific student or two to ask. Set this up for the student so he/she knows who to ask for clarification before going to you.

Alternate or Modified Assignments: Always ask yourself, "How can I modify this assignment to ensure the students at risk are able to complete it?" Sometimes you'll simplify the task, reduce the length of the assignment or allow for a different mode of delivery. For instance, many students may hand something in, the at-risk student may jot notes and give you the information verbally. Or, it just may be that you will need to assign an alternate assignment.

Increase One to One Time: When other students are working, always touch base with your students at risk and find out if they're on track or needing some additional support. A few minutes here and

there will go a long way to intervene as the need presents itself.

Contracts: It helps to have a working contract between you and your students at risk. This helps prioritize the tasks that need to be done and ensure completion happens. Each day write down what needs to be completed, as the tasks are done, provide a checkmark or happy face. The goal of using contracts is to eventually have the student come to you for completion sign-offs.

Hands On: As much as possible, think in concrete terms and provide hands-on tasks. This means a child doing math may require a calculator or counters. The child may need to tape record comprehension activities instead of writing them. A child may have to listen to a story being read instead of reading it him/herself.

Tests/Assessments: Tests can be done orally if need be. Break tests down in smaller increments by having a portion of the test in the morning, another portion after lunch and the final part the next day.

Seating: Seat students near a helping peer or with quick access to the teacher. Those with hearing or sight issues need to be close to the instruction which often means near the front.